Biochemistry - STRUCTURE

Biomolecules

Macromolecules

Or…major organic compounds

Carbohydrates

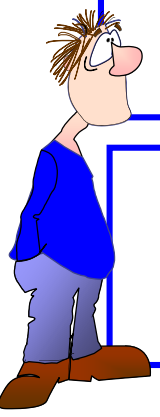
are organic compounds containing carbon, hydrogen, and oxygen in the ratio 1:2:1 (carbon:hydrogen:oxygen)

are made by autotrophs

are the body's **primary source of energy – QUICK ENERGY!**

come in two basic forms: **monomers and polymers**

are made of monomers (building blocks) called **monosaccharides**

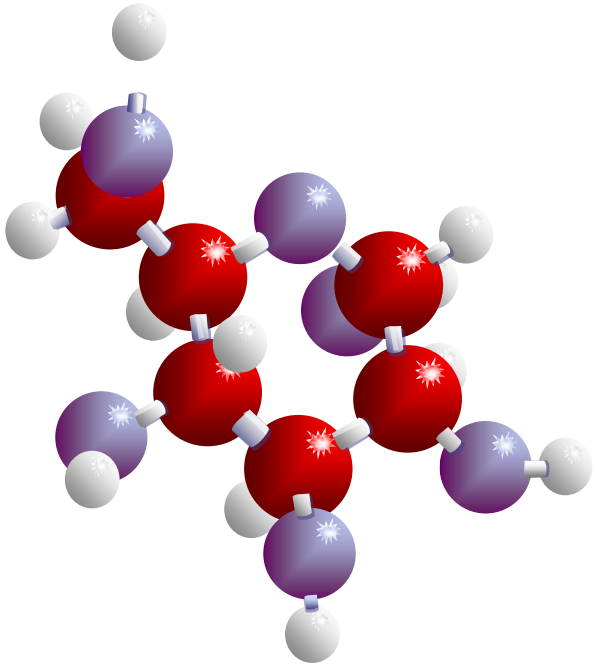


Monosaccharides are the building blocks of carbohydrates

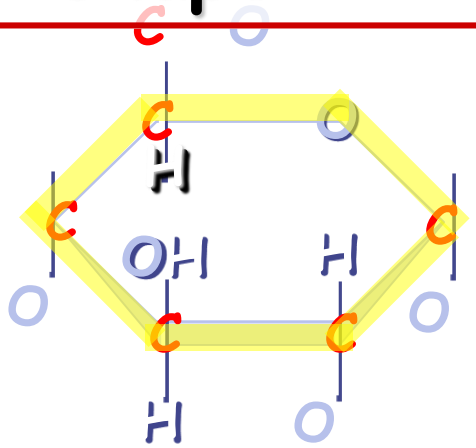
Glucose is a monosaccharide.

$C_6H_{12}O_6$

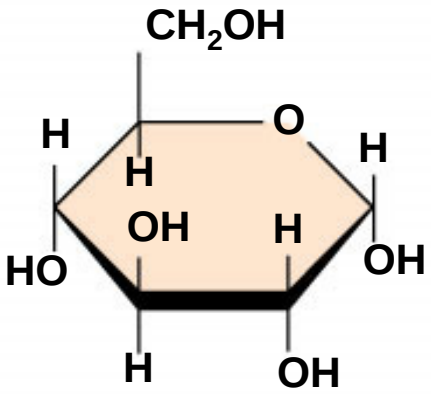
Other monosaccharides:
fructose (fruit sugar)
galactose (milk sugar).



Carbohydrates will usually be in a "ring shape"



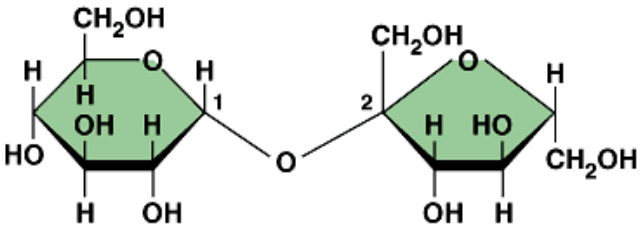
- **Names for sugars usually end in *-ose***
  - glucose
  - fructose
  - sucrose
  - maltose



glucose

$C_6H_{12}O_6$

fructose

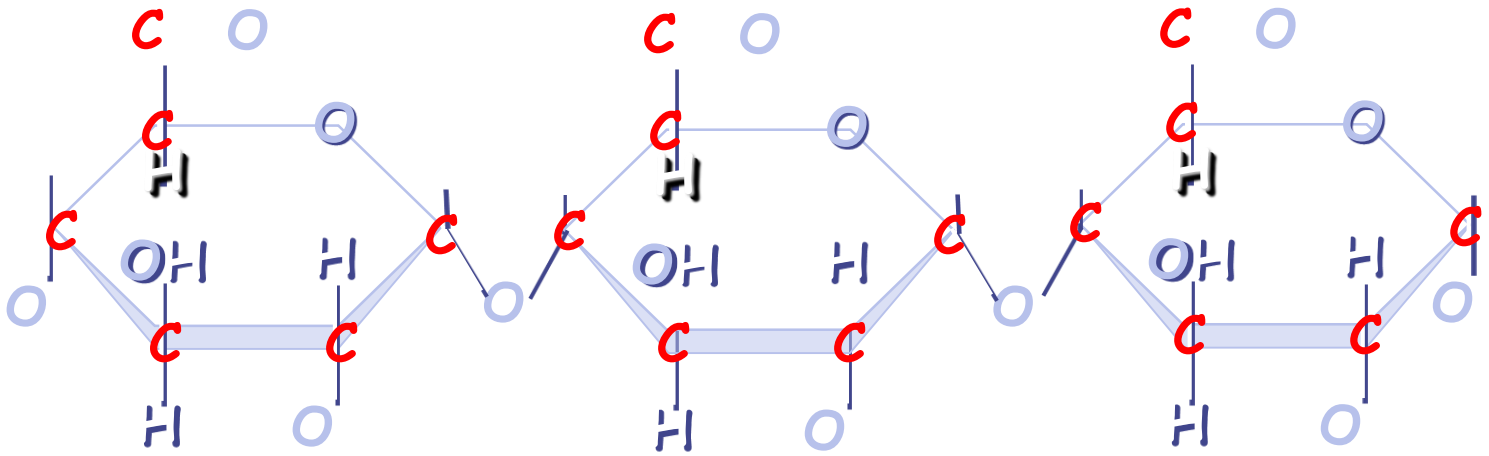


sucrose

maltose

Polysaccharides are complex carbohydrates made of long chains of **monosaccharides**.

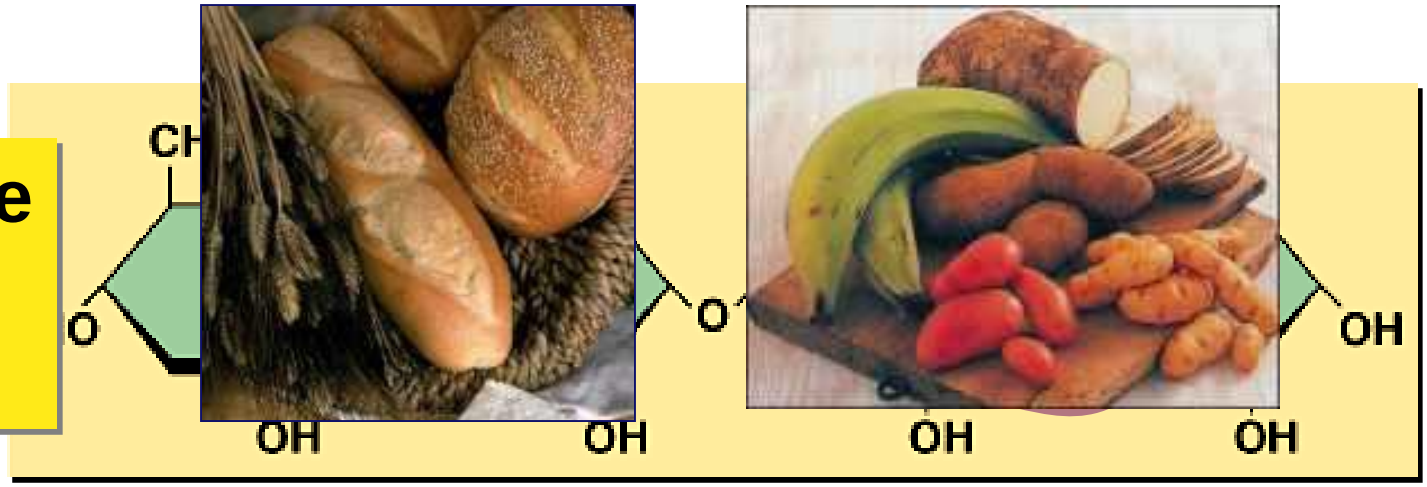
Starches (bread, cereals, and pastas) and **cellulose** (plant cell walls) are common sources of complex carbs.



Sucrose (table sugar) is an example of a sugar with only two monosaccharides.

Digesting starch vs. cellulose

Starches are easy to digest



cellulose hard to digest

Lipids

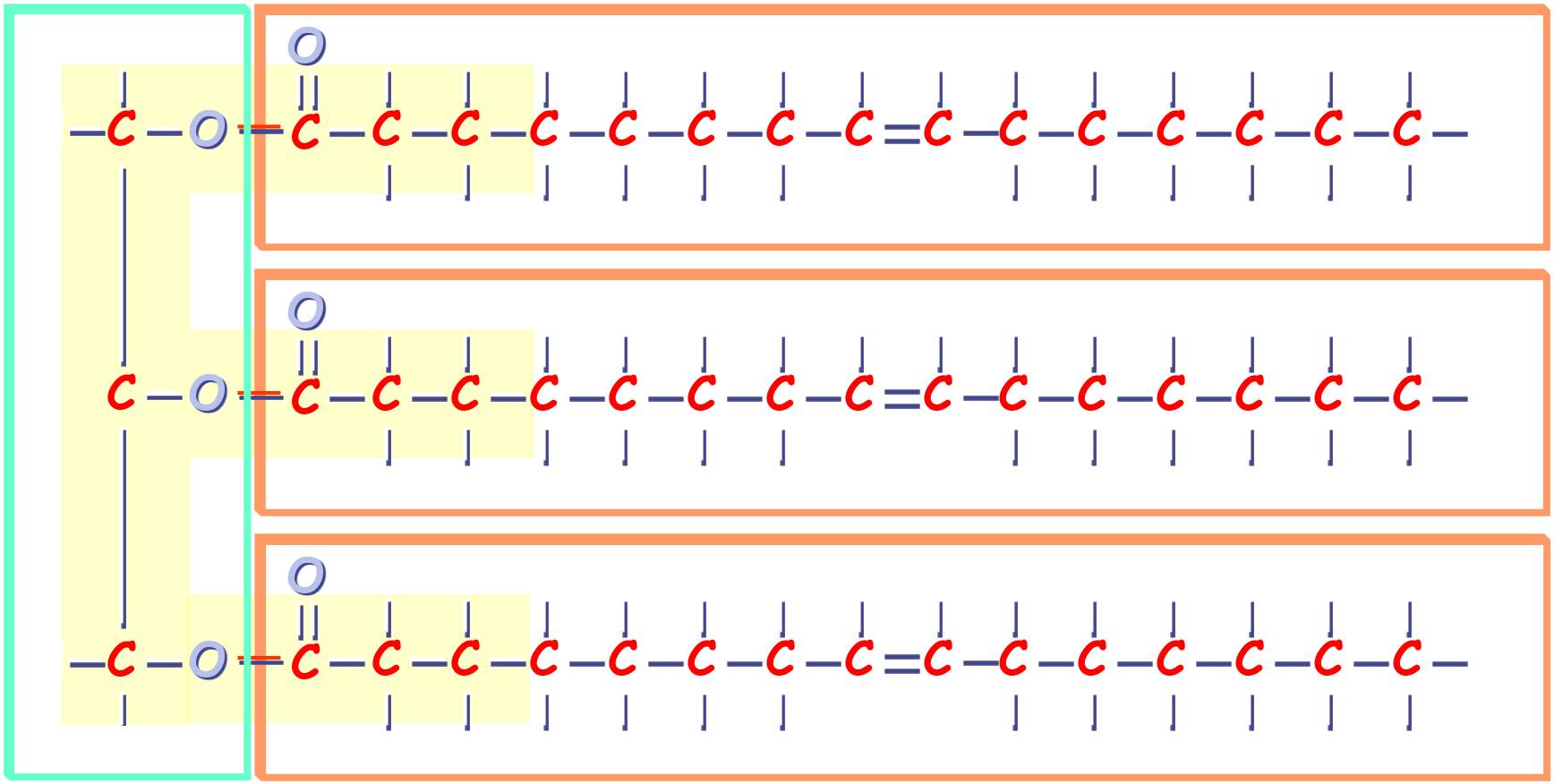
- Examples
  - fats
  - oils
  - waxes

Lipids

made up of

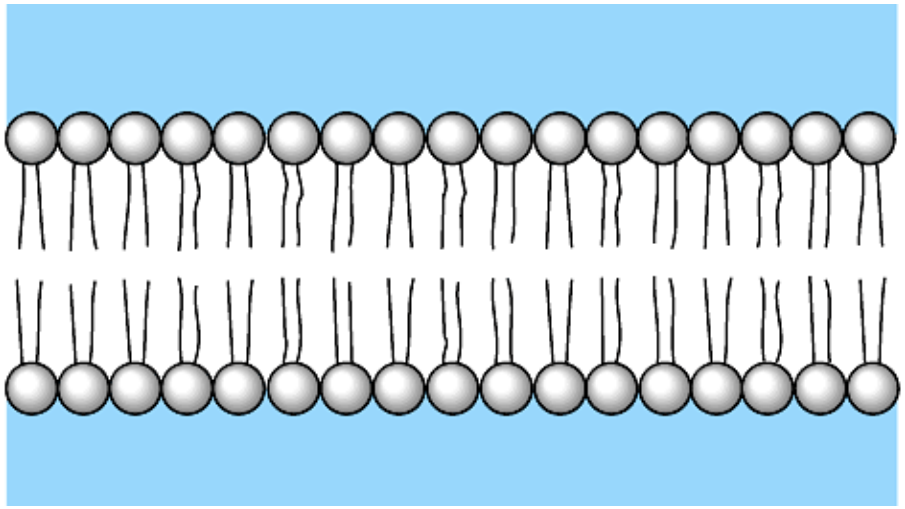
glycerol | and | fatty acids

Note the molecular structure's "E" shape

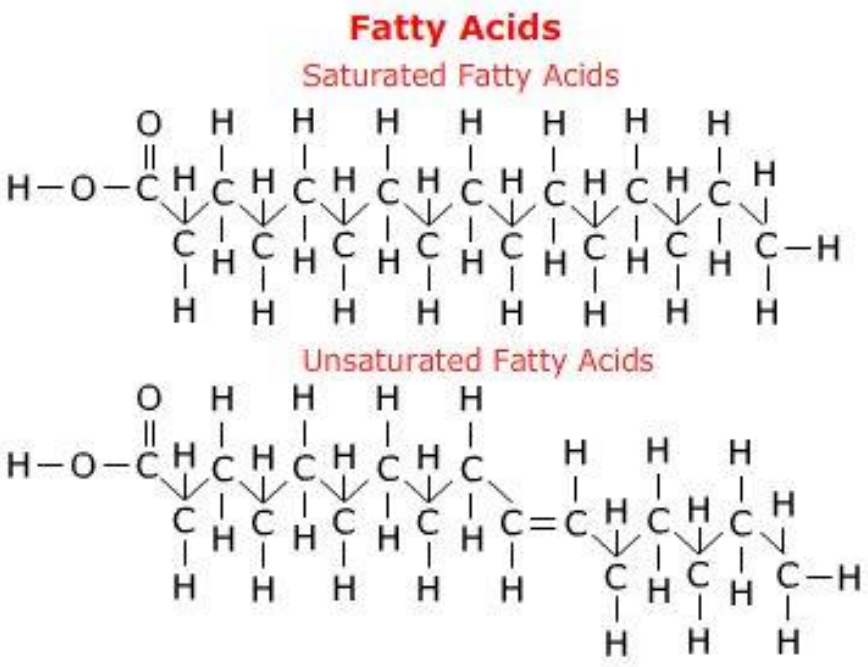


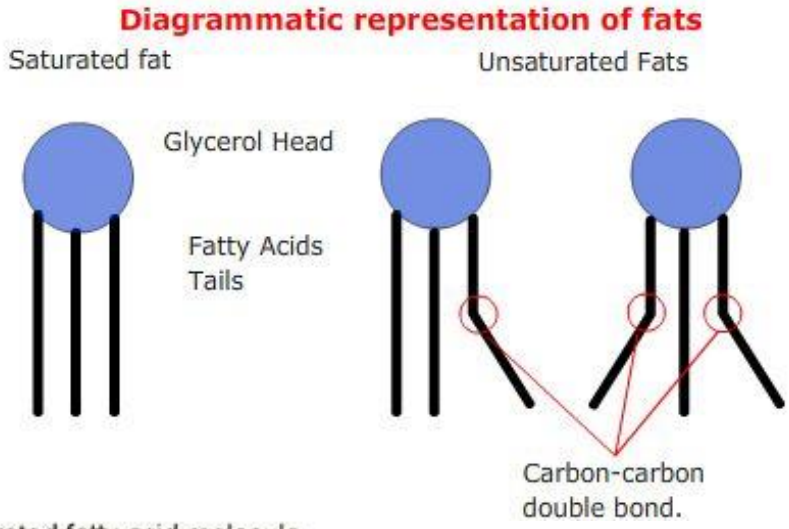
Other lipids in biology

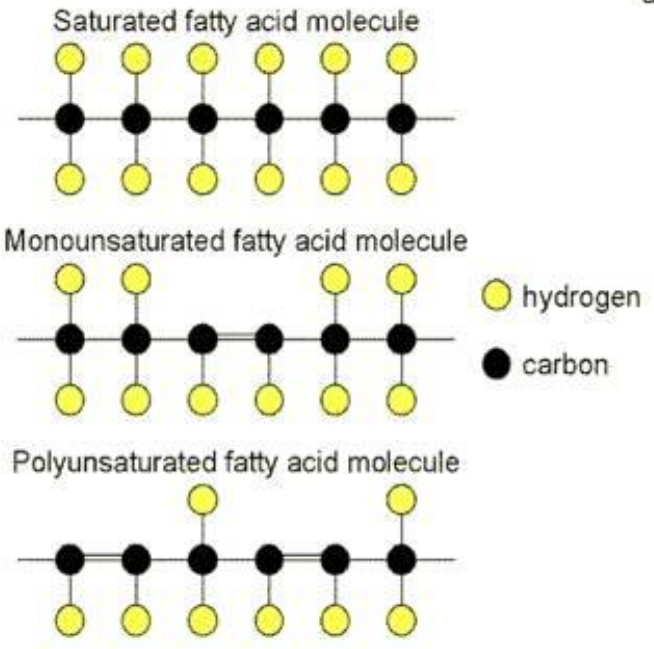
- Cell membranes are made out of lipids
  - phospholipids
  - heads are on the outside touching water
    - "like" water - hydrophilic
  - tails are on inside away from water
    - "scared" of water - hydrophobic
  - forms a barrier between the cell & the outside



Different types of fats





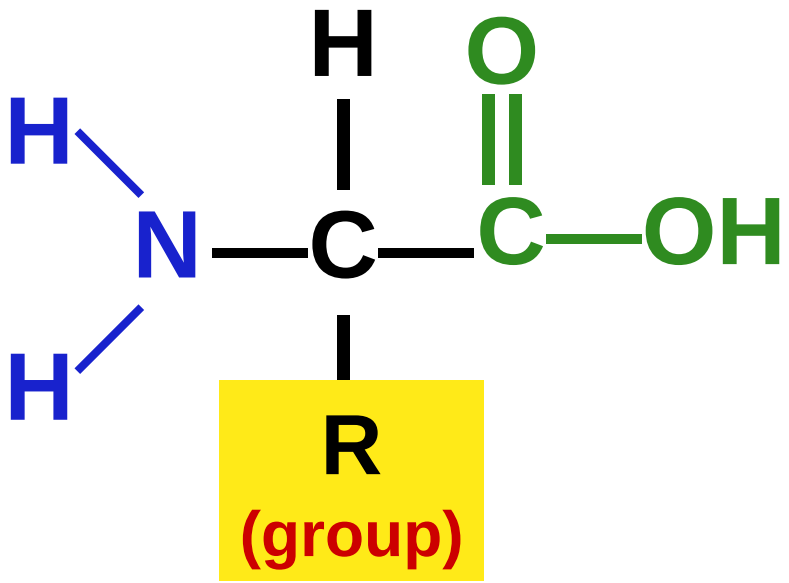


Proteins

- Monomer = **amino acids**

amino acid – amino acid – amino acid – amino acid – amino acid

- **Over 20 different amino acids**



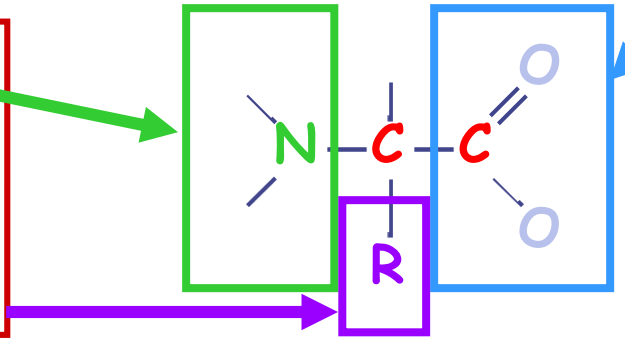
Proteins

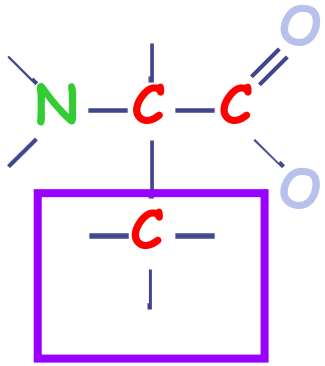
are made up of

an amino group

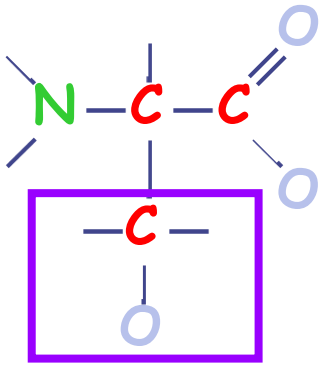
a carboxyl group

and an "R" group which varies in the different amino acids



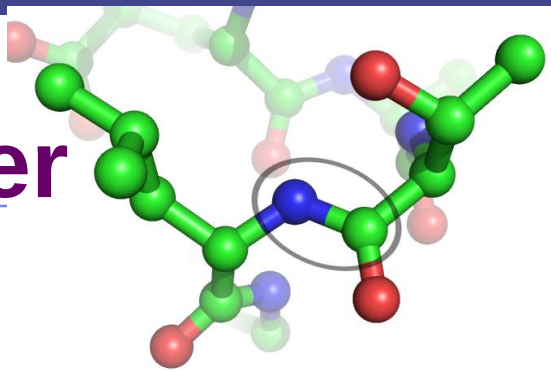


Alanine

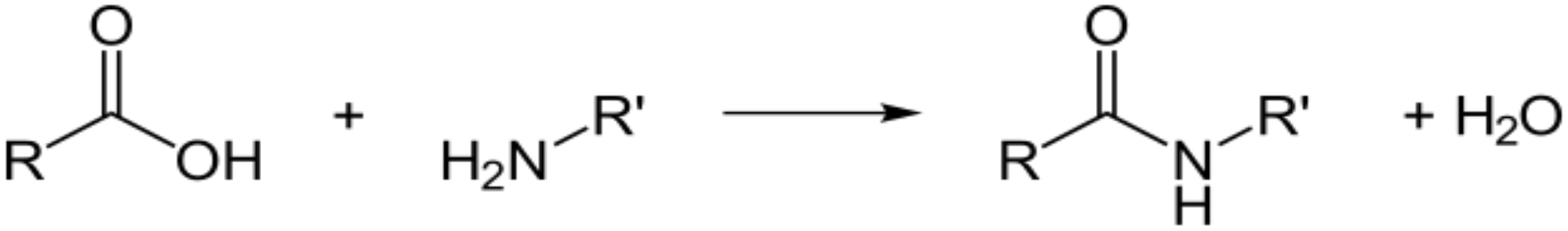


Serine

Putting PROTEINS together



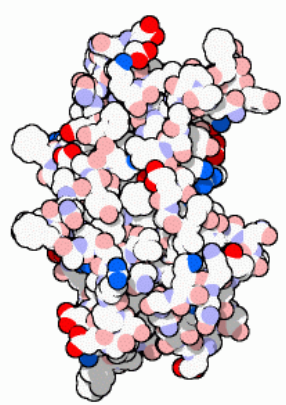
- Held together by peptide bonds
- Peptide bonds are formed through dehydration synthesis (loss of a water molecule)
- Peptide bonds can be broken by hydrolysis (addition of a water molecule



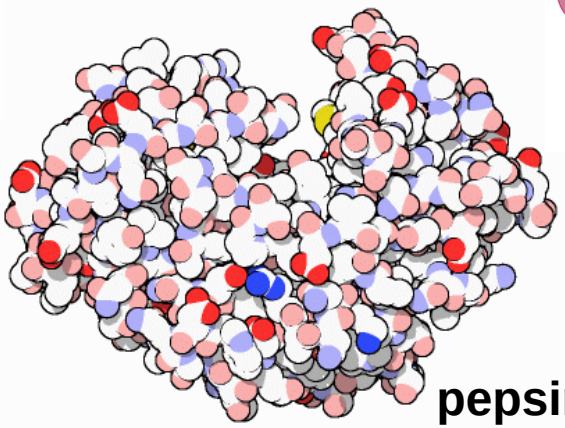
Dehydration synthesis

For proteins: SHAPE matters!

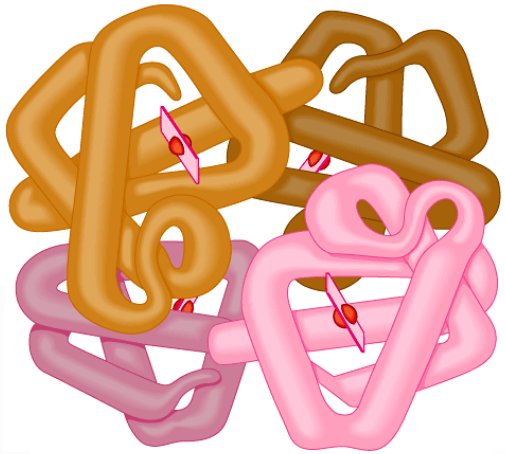
- Proteins fold & twist into 3-D shape
  - that's what happens in the cell!
- Different shapes = different jobs



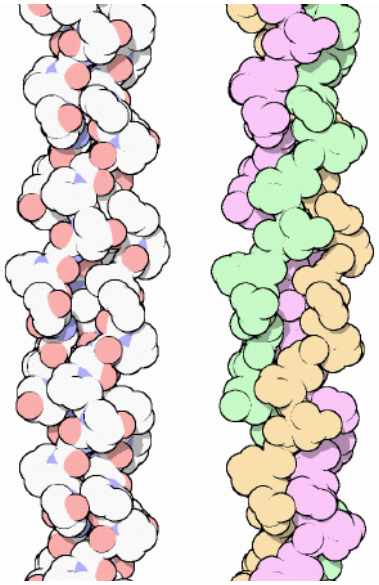
growth hormone



pepsin



hemoglobin

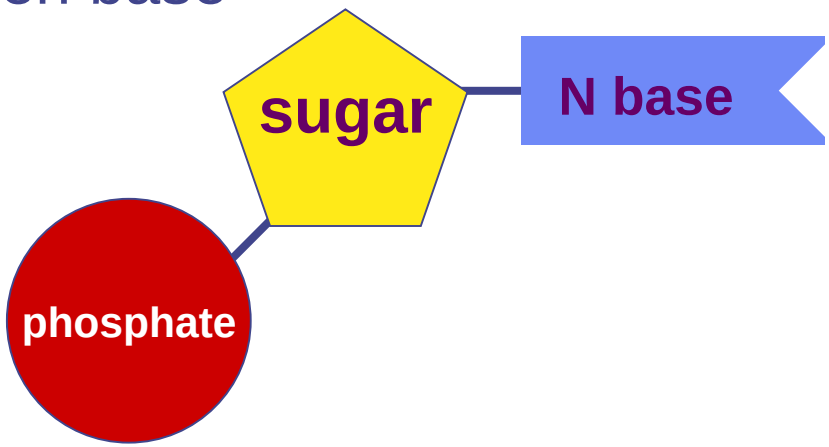


collagen

Nucleic acid structure

Monomer= nucleotide

- nucleotides are made of a sugar, phosphate, and nitrogen base

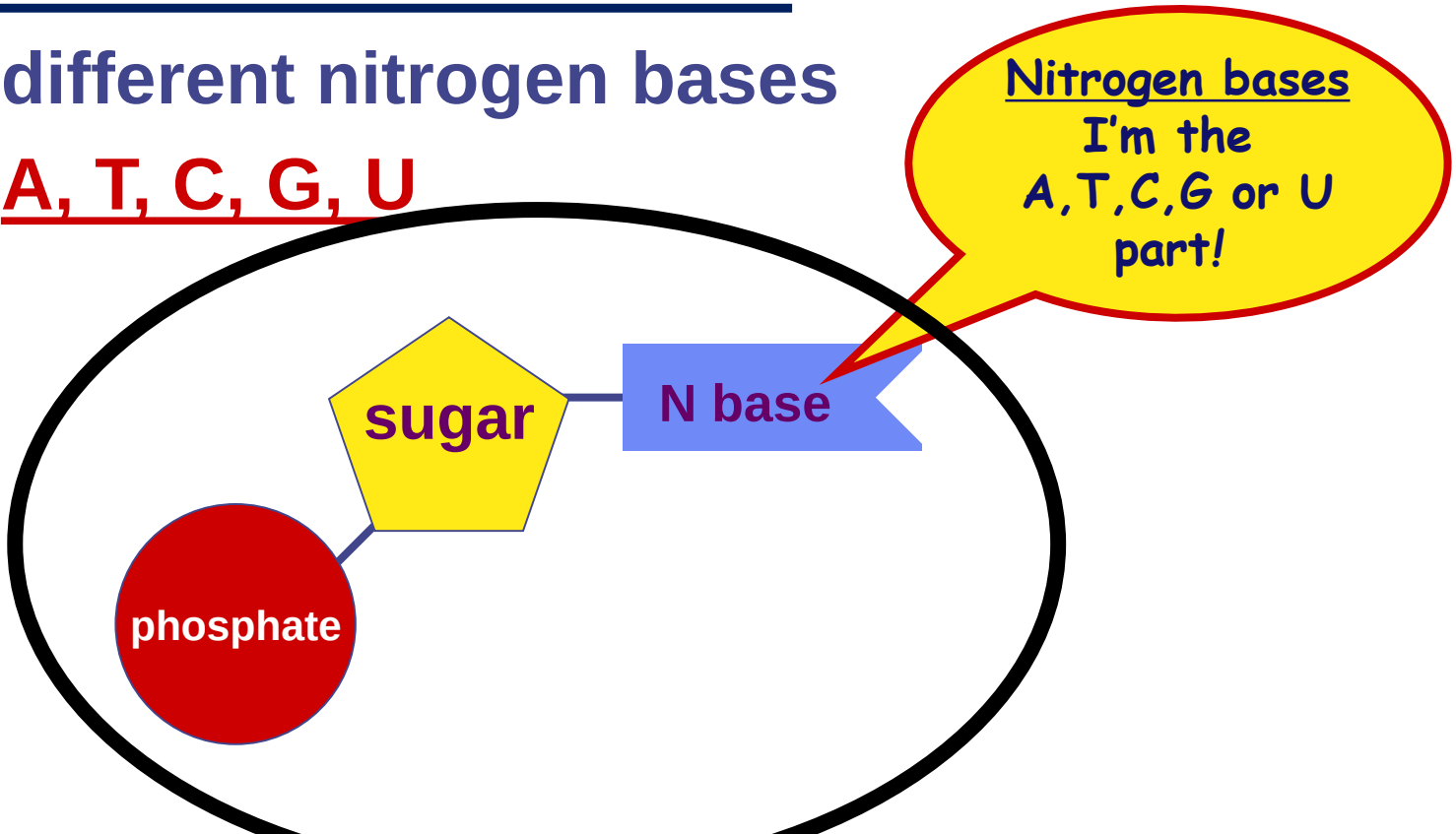


Nucleic acids

- Monomer = nucleotides

nucleotide – nucleotide – nucleotide – nucleotide

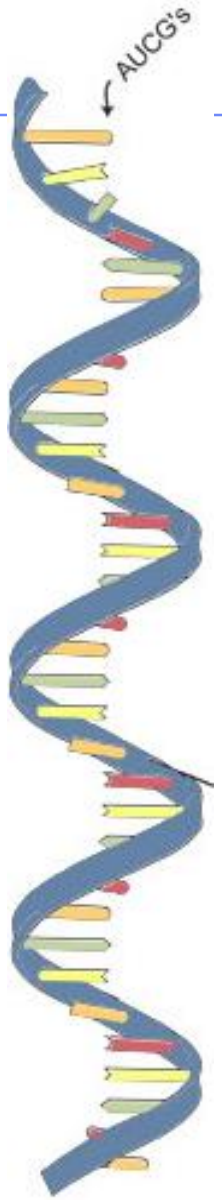
- **5 different nucleotides**
  - different nitrogen bases
  - **A, T, C, G, U**



Nucleotide chains

- **Nucleic acids**
  - nucleotides chained into a **polymer**
    - DNA
    - RNA

DNA



RNA